ACTEWAGL DISTRIBUTION
MURRUMBIDGEE ECOLOGICAL MONITORING PROGRAM

PART 3: MURRUMBIDGEE PUMP STATION
SPRING 2010

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Approved by:	Manager Water Sciences	Norm Mueller		26 July 2011

For further information on this report, contact:

Name: **Norm Mueller**
Title: Manager Water Sciences, ACT
Address: 16B Lithgow St, (PO box 1834) Fyshwick, ACT, 2609

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Executive Summary

The Murrumbidgee Ecological Monitoring Program (MEMP) undertakes baseline ecological monitoring of the Murrumbidgee River to allow assessment of potential environmental impacts derived from abstraction of water for the ACT Water Supply.

This report focuses on the Murrumbidgee Pump Station (MPS) component of the program.

The high flows experienced at the sites monitored under the MPS component during spring 2010 prevented safe access for samplers.

Two significant storm events occurred during spring 2010 that affected the sampling program. The first on 4 September 2010 was approximately a 1 in 2 year Average Recurrence Interval (ARI) event and the second event on 15 October 2010 was approximately a 1 in 5 year ARI event.

Of the results available, including on-line data, water quality within the river was associated with the storm events resulting in high turbidity and nutrients, and an increase in baseline pH levels.

This report provides a summary of the water flow data and upstream in-situ water quality information collected during spring 2010.

Continuous water quality data is available upstream at Lobb's Hole during the storm events for pH, turbidity, dissolved oxygen, electrical conductivity and temperature. Only one grab sample result is available at a MPS sampling site for nutrients, which returned total nitrogen and total phosphorus levels above the ANZECC (2000) guideline recommended values. This is consistent with other water sampling results taken further upstream along the Murrumbidgee River.

1. INTRODUCTION

The Murrumbidgee Ecological Monitoring Program was set up by ACTEW Corporation to evaluate the potential impacts of water abstraction from the Murrumbidgee River. It is being undertaken as part of the ACT Water Supply security infrastructure upgrade and being managed by ActewAGL Distribution. The proposed timeline is to undertake macroinvertebrate sampling in spring and autumn over a three year period that commenced in spring 2008.

There are four component areas considered:

Part 1: Angle Crossing

Part 2: Burra Creek (discharge point for Angle Crossing abstraction)

Part 3: Murrumbidgee Pump Station (MPS)

Part 4: Tantangara Dam to Burrinjuck Reservoir

This report focuses on Part 3: Murrumbidgee Pump Station.

The Murrumbidgee Pump Station (MPS) is located just downstream of the Cotter River confluence with the Murrumbidgee River. It is adjacent to the Cotter Pump Station which has the capacity to abstract up to 50ML/d. Construction has recently been completed to increase the total abstraction capacity to 150ML/d at the MPS. The upgraded infrastructure provides a recirculating flow from the Murrumbidgee to the base of the proposed Enlarged Cotter Dam (ECD); this project is referred to as Murrumbidgee to Cotter (M2C) transfer.

The increase in abstraction at the Murrumbidgee Pump Station (MPS) may place additional stress on the downstream river ecosystem. This monitoring program has been established to monitor the condition of the Murrumbidgee River in terms of water quality and ecological condition at key sites both upstream and downstream of the extraction point (MPS). Monitoring will eventually extend to the period after the proposed abstractions are implemented and data collected in that phase will be compared with those collected as part of the baseline study.

The information derived from this program will support ACTEW's and the ACT Environmental Protection Authority's (EPA) adaptive management approach to water abstraction and environmental flow provision in the ACT.

Fortunately for the Murrumbidgee catchment and downstream receiving waters there have been significant inflows to the Murrumbidgee River during spring 2010. Unfortunately for the baseline monitoring program, it was not possible to undertake the macroinvertebrate sampling at the MPS site due to high flows, predominately coming from the Cotter River catchment.

This report therefore simply provides a summary of the water flow data and upstream in-situ water quality information collected during spring 2010. To review methodology used for the MEMP program during spring please refer to the reports issued for Parts 1 and 4 (ALS, 2010a,2010b). Also refer to these reports for the river health assessment on other sections of the Murrumbidgee River.

2. STREAM FLOW AND RAINFALL DATA

Murrumbidgee River flow and rainfall for the spring sampling period were recorded at ALS gauging stations at Lobb's Hole (410761), downstream of Angle Crossing, and Mt. MacDonald (410738), downstream of MPS and Cotter River confluence. Site locations and codes are given in Table 1.

Table 1. Location and details of continuous rainfall, water quality and flow stations.

Site Code	Location/Notes	Parameters*	Latitude	Longitude
570825	Pierces Creek weather station	Rainfall	S -35.3322	E 148.9189
410738	Murrumbidgee River @ Mt. McDonald	WL, Q	S -35.2917	E 148.9565
410761	Murrumbidgee River @ Lobb's Hole (D/S of Angle Crossing)	WL, Q, pH, EC, DO , Temp, Turb, Rainfall	S -35.5398	E 149.1015

* WL = Water Level; Q = Rated Discharge; EC = Electrical Conductivity; DO = Dissolved Oxygen; Temp = Temperature; Turb = Turbidity; Rainfall = Tipping bucket raingauge (in 0.2 mm increments).

The flows for the Murrumbidgee River upstream and downstream of MPS can be seen in the following figures for spring 2010. It can be seen from Figure 1 that there was a moderate event in both September and October. The much higher flow at Mt MacDonald (410738) compared to Lobb's Hole (410761) indicates that significant inflow came from the Cotter catchment which increased the peak flow to 67,000 ML/d for the 15 October event.

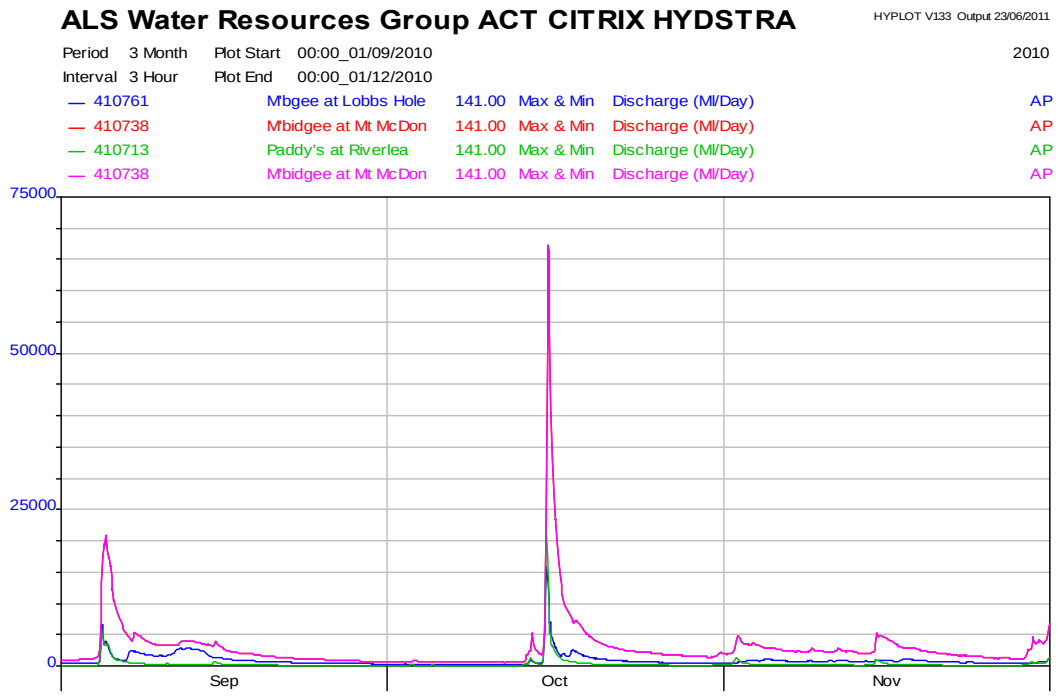

Figure 1: Murrumbidgee hydrograph for spring 2010.

Daily rainfall during this period is plotted down from the top of the plot in Figure 2 in addition to a log plot for the flows. It can be seen that the daily total rainfall for the October event was actually less than the September event, but the preceding rainfall would have increased soil saturation levels inducing the higher October runoff.

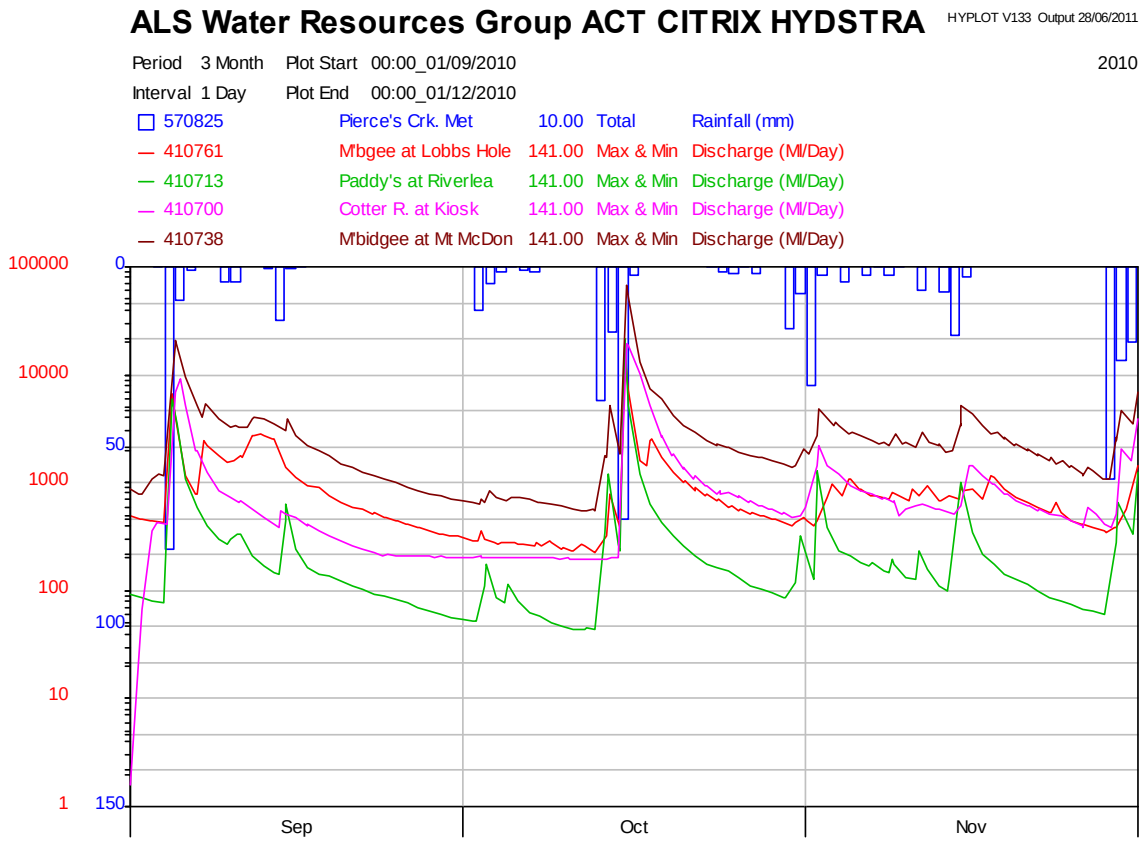

Figure 2: Murrumbidgee hydrograph for spring 2010 on a log scale with daily rainfall totals.

The 15 October 2010 peak flow of 67,000 ML/d at Mt MacDonald (410738) is approximately a 1 in 5 year Average Recurrence Interval (ARI) event for the Murrumbidgee River at that location. The 4 September 2010 event peaked at 20,500 ML/d and is approximately a 1 in 2 year ARI event.

The ARI probability was determined using historical data in the ALS HYDSTRA data management system using a Log-Pearson Type III analysis. ARI can also be expressed as the Annual Exceedance Probability (AEP) and the probability versus flow is plotted in Figure 3.

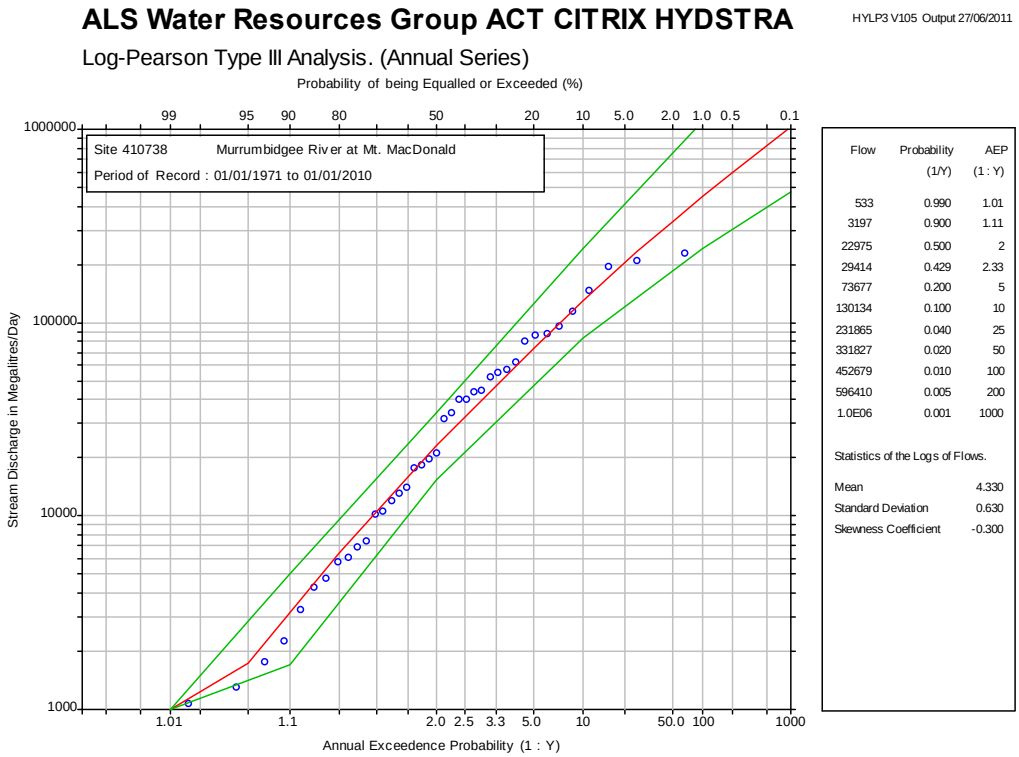

Figure 3: Annual Exceedence Probability versus discharge plot for Mt Macdonald.

After a storm event AUSRIVAS protocol generally requires a 4 week period to allow the river system to re-stabilise prior to sampling (Coysh et al. 2000). After the September storm event sampling for the MEMP project commenced in early October at the upstream sites. Then another significant storm event occurred on 15 October which delayed any further sampling.

Several site visits were undertaken to attempt the MPS sampling program after a minimum of 2 weeks, however the continuing high depth of water prevented a sampling regime being undertaken. See photos below.

Plates 1 and 2: Murrumbidgee River upstream of Cotter River confluence looking toward Cotter Rd. bridge, and river depth in riffle zone too deep for sampling.

A plot of the Murrumbidgee flow in November is given in Figure 4.

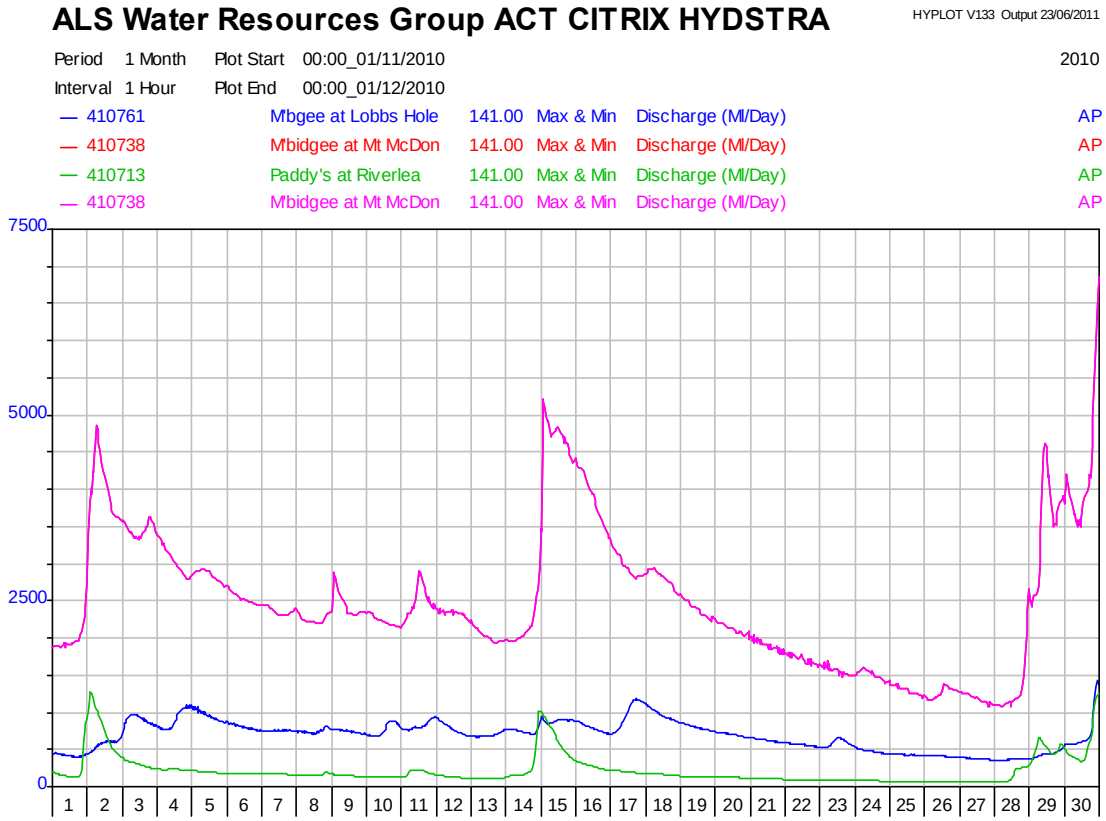

Figure 4: Murrumbidgee hydrograph at Mt MacDonald for November 2010.

From earlier site assessments it was determined that a flow below approximately 700 ML/d was required before sampling could commence. This was not achieved during the remainder of the spring period and into early December. Several rainfall events again increased the river flow such that a spring sampling run had to be abandoned.

Table 2: Spring rainfall and flow summary for Lobb's Hole and Mt. MacDonald.

Site	Pierce's Ck (570825)	Lobb's Hole (410761)		Mt. MacDonald (410738)
	Rainfall Total (mm)	Rainfall Total (mm)	Mean Flow (ML/d)	Mean Flow (ML/d)
September	113.4	87.2	1119	2831
October	178.4	151.2	858.6	3487
November	185.6	133.4	689.9	2482
Spring 2010 total	477.4	371.8		
Max. daily rainfall in spring 2010	78.6 (4 Sep)	65.0 (15 Oct)		
Spring long term mean rainfall	219.2 (since 1996)	192.1 (since 1975)		
Spring 2010 average			889.2	2933
Spring long term average			996.6 (since 1975)	1908 (since 1970)

Table 2 shows that the total spring 2010 rainfall was well above average compared to the long term spring mean, whereas the spring mean flow of 889 ML/d at Lobb's Hole was 10% below the long term mean flow. Mt. MacDonald's spring 2010 flow of 2930 ML/d was 54% above the long term mean spring flow.

This indicates that the flows at Lobb's Hole are dependent on the spatial rainfall distribution within the whole catchment upstream and not necessarily consistent with local rainfall measurements. The significant above average rainfall at Lobb's Hole and Pierce's Creek is reflected in the above average flow at Mt MacDonald with a significant contribution from the Cotter River and Paddy's River catchments.

3. WATER QUALITY DATA

Continuous water quality data for MPS is collected at Lobb's Hole (410761), which is upstream of the ACT urban area. (It is a downstream impact site for M2G). Data is collected using an in-situ Hydrolab 5a multi-parameter probe. The results over the spring period are given in Table 3 below.

Results indicate a consistent pH level and saturated dissolved oxygen levels, with elevated turbidity due to the size of the storm events in September and October. Electrical conductivity is lower than during previous low flow periods.

A plot of the continuous data for spring 2010 is shown in Figure 5 with a grab sample result for MUR 28 in Table 4. Consistent with previous season's water sample results, Murrumbidgee River total nitrogen and total phosphorus levels are above the ANZECC (2000) guideline recommended values. These values are not just the result of high streamflow as they have also been above ANZECC guideline levels during previous normal and low flow periods.

Table 3: Monthly water quality statistics from upstream of MPS at Lobb's Hole (410761).

(All values are monthly means, except D.O. % Saturation which is expressed as mean monthly minimums and maximums)
(ANZECC guideline values shown in red. Yellow cells indicate values outside of ANZECC and ARMCANZ (2000) guidelines).

Analyte	Temp. °C	EC (us/cm) (30-350)	pH (6.5-8.0)	Turbidity (NTU) [Max. in brackets] (2-25)	D.O (% sat.) (90-110)
September	12.5	62	7.75	26 [775]	96-100
October	17.1	72	7.68	45 [750]	97-101
November	20.2	82	7.71	18 [145]	93-100
Spring	**16.6**	**72**	**7.71**	**29 [775]**	**95-101**

Note: ANZECC trigger values are based on individual sample results and are not directly applicable to monthly average values and therefore must be interpreted accordingly.

High peak turbidity values in the brackets of the table are consistent with high sediment laden water during stormwater runoff peaks from upstream agricultural areas and gully erosion on hillsides. The high average turbidity values are consistent with ongoing, thought gradually reducing, fine sediment in the water after an event.

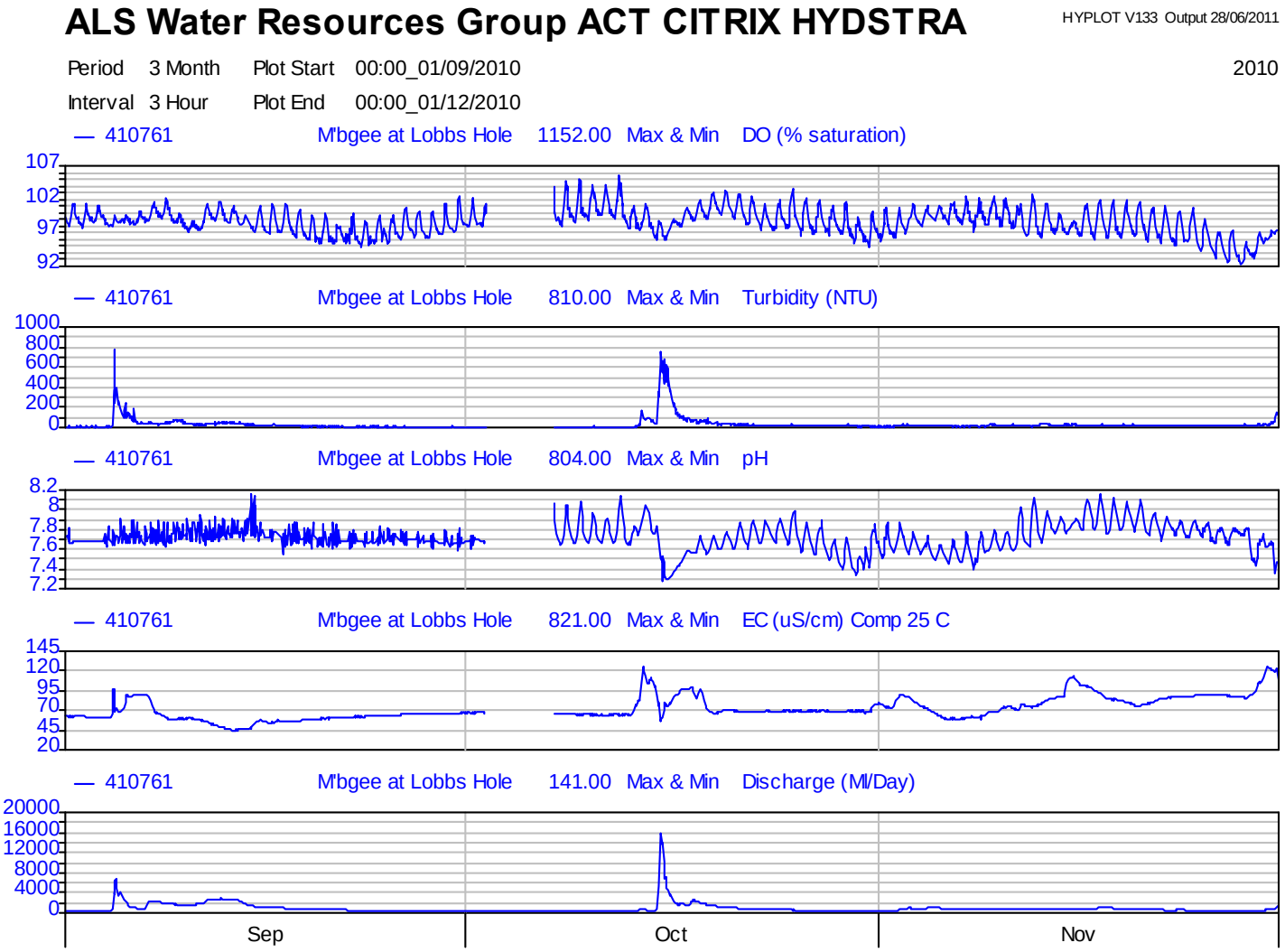

Figure 5: Spring 2010 in-situ water quality record for Lobb's Hole (410761).

Table 4: Grab sample water quality result from spring 2010.

(ANZECC guideline values shown in red). Yellow cells indicate values outside of ANZECC and ARMCANZ (2000) guidelines.

Location	Site	Time Date	Temp (°C)	EC (µs/cm) (30-350)	Turb. (NTU) (2-25)	TSS (mg/L)	pH (6.5-8)	D.O. (% Sat.) (90-110)	Dissolved Oxygen (mg/L)	Alk. (mg/L)	NOX (mg/L) (0.015)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	TP (mg/L) (0.02)	TN (mg/L) (0.25)
Upstream	MUR 28	0800 26/11/10	22.1	82	14	14	7.32	100.1	9.06	33	<0.01	<0.01	<0.01	0.01	0.04	0.48

Table column heading abbreviations:

Temp = Temperature
EC = Electrical conductivity
Turb. = Turbidity
TSS = Total suspended solids
D.O = Dissolved oxygen
Alk. = Alkalinity
NOx = Nitrogen+oxygen compounds
TP = Total phosphorus
TN = Total nitrogen

4. REFERENCES

ALS, 2010a. Murrumbidgee Ecological Monitoring Program. Part 1: Angle Crossing, Spring 2010. Report number CN211063 -AC-S10-R6.

ALS, 2010b. Murrumbidgee Ecological Monitoring Program. Part 4: Tantangara Dam to Burrinjuck Reservoir, Spring 2010. Report number EE2011-64.

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Coysh, J.L., Nichols, S.J., Simpson, J.C., Norris, R.H., Barmuta, L.A., Chessman, B.C. & Blackman, P. (2000) Australian River Assessment System (AUSRIVAS) National River Health Program Predictive Model Manual. Co-operative Research Centre for Freshwater Ecology, Canberra.